

## MODERN ASPECTS OF MODELING OF TRANSPORT ROUTES IN KAZAKHSTAN

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### ABSTRACT

The report consists of the summary, keywords, introduction, contains 7 pages of the typewritten text, 4 figures, includes the 4names of the used literature.

**KEYWORDS:** Route of Transportations, Goods Turnover, Transport Network, Model of Transportations, Licensing, Deliveries of Freights, Integration of Transport System, Logistics, Criteria of Optimization, Car Mileage

### INTRODUCTION

Insufficiency of Kazakhstan transport network development does very actual a problem of optimization of goods transportation it by modeling of their following routes.

In statement and performance of this task the key role belongs to the logistic organizations. Their tasks on rationalization of transportations also will be a basis for development of the Republic transport network.

### Main Text

In 2012, in a number of CIS countries was noted the slowdown in the volume of cargo and freight. Transportation of goods (without pipelines) compared to previous year in the whole of the CIS increased by 4.5 % (in 2011 to 11.8 %), turnover increased by 3.9 % (6.7%), transportation of goods by road in Kazakhstan amounted to 2, 716, 1 million tons (up to 9.6 %), while in Russia - 1 693.0 million tons (up to 2.3%) and Kyrgyzstan - 25.4 million tons (up to 6.3%) [1].

The most important indicator of integration of the transport system of the Republic of Kazakhstan is the efficient use of existing transport networks, the realization of the benefits of their geographical location and communication skills, providing the shortest route to the Eastern European countries and Asian continents. But in order to improve the transport systems of the republic to get the characteristics of a world-class, it is necessary to carry out a comprehensive modernization of the industry, as in market conditions, an important requirement of the consumer of transport services is timely and qualitative delivery of cargo. The run of the specified conditions is possible with the use of logistics, that is, the control algorithm, which is with the help of a variety of economic and mathematical techniques allows to optimize the performance of individual elements of the transport process and to combine these elements into a single system. Insufficient development of logistics progressive freight transport technology systems leads to an increase of transport costs, therefore, to the loss of the market.

The difficult economic situation in our country requires from workers of road transport increased attention in dealing with the organization and management of road transport. In particular the modeling of routes, as one of the important and serious problems in transport controlling, requires a rethinking of the methods and approaches to solution, as well as the use of the latest achievements in the field of information technology.

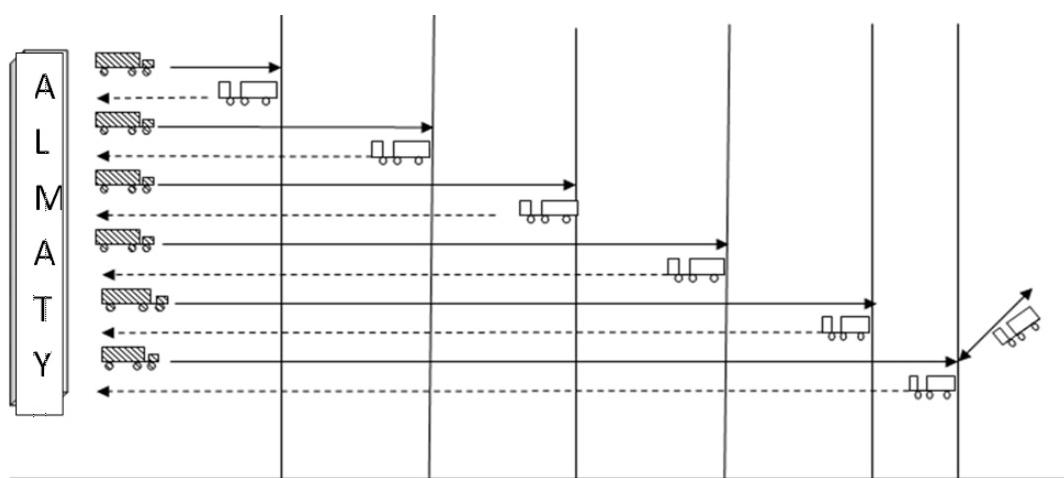
The modern approach to the problem of modeling the routes includes:

- Intellectualization of algorithms of solutions and extensive use of heuristic methods ;
- Complexity of the problem by switching from the classical scheme of one-criterion optimization to the method of vector ( multi-criteria ) optimization of solutions ;
- The use of modern computer tools and communication for the solution of problems of transport management in real-time.

The problems solved in transport are often characterized by high complexity and are so-called DP-difficult problems [2]. In this regard, the traditional methods of problem solving here are powerless - the effect of the increased demands on machine resources in the implementation of these algorithms. Another problem facing the task of modeling of transport routes is the right choice of optimization criterion that can effectively solve the problem and help to justify the choice, regardless of ownership trucking companies.

Nowadays every transporter determines the route, timetable, negotiates the price and tries to fulfill customer's orders. However, due to the lack of feedback from suppliers or motor transport enterprises from another region, on the way back without finding customers or associated cargo basically returns empty, thus wasting time and expected income. Many people agree on the way back to deliver the goods at half price to reimburse fuel costs.

Figure 1 shows the current pattern of using trucks on the example of transportation of goods from Almaty city to regions of the Republic. The main recipient and sender are the markets and logistics centers in Almaty, where is entered and distributed the main stream of consumer goods, electrical engineering, construction materials, etc.



**Figure 1: The Current Model of Organizations of Long-distance and Domestic Road Transportation from Almaty, Republic of Kazakhstan**

Therefore, to motor carriers of Almaty and other cities these figures formed the most simple one-criterion function. The most frequently used are:

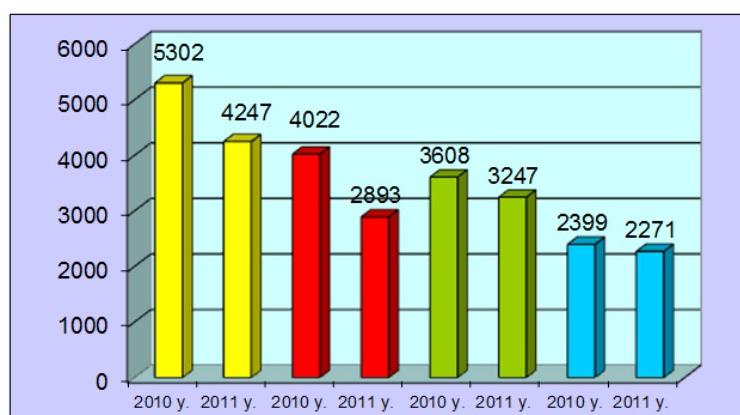
- Maximizing of quantity of cargo;
- Minimizing the number of used cars to carry out a predetermined amount of cargo;
- Minimization of the total transport work;
- Minimization of the total distance, etc.

When using the truck utilization rates run up to 0.5-0.6. These indices in transportation to a distance of over 200 km, demonstrated inefficiency, since downtime of vehicles for loading and unloading, rest time of drivers, etc., has become much higher [3]. Thus, the ratio of trucks on the job was not effective enough. As a result, many trucking companies lose potential revenue and its place in the market of transport services. The main disadvantage is the lack of modern infrastructure, inter-connections between motor transport enterprises, etc.

On the other hand the rules of carriage of goods and passengers are often violated. For example, for 12 months in 2011 on road transport was identified 18556 administrative violations ( 2010 - 20197 ), executed 4881 receipts (2010 - 6390 ), made up 13678 protocols ( 2010 - 13807 ). As a result of review of cases were handed 242 administrative sanctions in the form of a warning (2010 – 229), 14927 decisions on the imposition of an administrative fine in the amount of more than 135 mln. (In 2010 y. 14918 more than \$ 126 million tenge) sent to the court, 220 to consideration (2010 - 379 ) and 908 administrative cases - to enforce the resolution to impose an administrative fine ( 2010 - 500 ).

The analysis on administrative practice shows the number of administrative cases drawn in 2011 in comparison with the previous year. It is decreased by 9% (Figure 2):

- Violation of the rules of transportation of passengers and baggage in 2011 - 4247, 2010. - 5302 (-20 %);
- Violation of the rules of operation of vehicles in 2011 - 2893, 2010. - 4022 (-71 %);
- Violation of the rules of carriage of indivisible loads in 2011 - 3247, 2010. - 3608 (-11 %);
- Violation of work routine and rest areas in 2011 - 2271, 2010. - 2399 (6%);
- Violation of fire safety in transport in 2011 - 2381, 2010. - 2548 (-7 %)



**Figure 2: Indicators of Violations of Road Transport in the Republic of Kazakhstan**

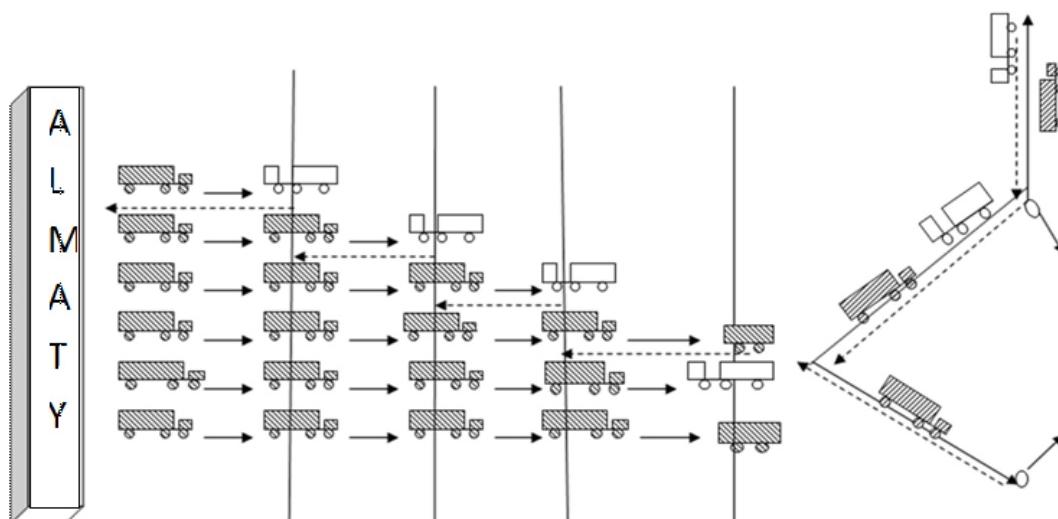
However, the performance of detection for some violations have increased as follows:

- Violation in the licensing in 2011 - 371, 2010. - 59 ( 159 %);
- Violation of the rules of transportation of passengers and cargo in international traffic, in terms of travel without permission, the list of passengers and cabotage in 2011 - 574, 2010. - 388 ( 33 %) [ 4].

Now the industry has the task of forming multi-criteria optimization functions on the basis of one-criterion functions. To have the parameters of these functions are conducted the evaluation of mutual closeness of the criteria. Formulation of optimization problems in transport planning with multiple criteria optimization is a consequence of a transport market and the natural tendency of trucking companies to satisfy the interests of all participants in the transportation business, not just the consignees or consignors.

Modern transportation becomes faster and the route between two entities, with proper organization and management of work trucks, could take less time. In such situation it is necessary to create and implement real-time systems that can allow operational management decisions. Drivers of vehicles can find out the situation on the road, adjust their route taking into account the prevailing circumstances and cause the necessary assistance in case of emergency situations.

On the basis of modern information systems for organizations of long-distance freight traffic with the assistance of local (regional) road transport is more advantageous to use the principle of "Amanat". The proposed model of organizations of freight is different in that the route change cars, trucks, trailer loaded with one document is transmitted from the towing vehicle to the next, so the time of goods in transit is reduced ( Figure 3).



**Figure 3: The Proposed Model of Long-Distance Road Transport Organizations of Almaty City**

The positive impact of the trucking business model is increase of employment, reduce of unemployment, increase of incomes by attracting local, regional vehicles and infrastructure development of road transport industry.

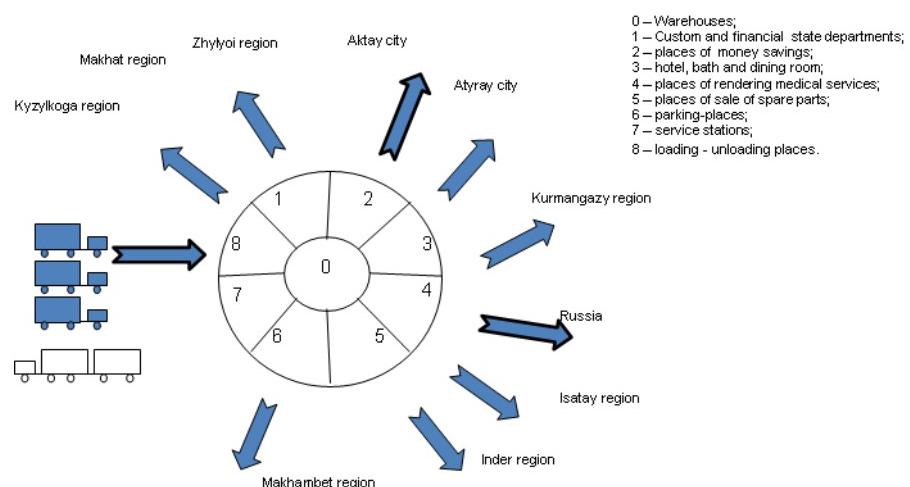
To implement the proposed model "Amanat" at first it is required a lot of number of workers, but the time of their employment will be temporary, limited by term of infrastructure of construction and road transport industry. While the employment is in the second stage the development of repair and service facilities will be permanent. And it excludes the

possibility of sequential involvement of employees during all phases. This is especially important for the local population and filling the budget.

There will be a need for highly skilled workers, specialists with higher and secondary special education, both directly in the office or on the line. Thus, the proposed model is more efficient from a social point of view. Competition in the market increases, it becomes more difficult to hold the position. And the most important place takes the qualification of personnel of companies for long distance and international road transportation. It's not only about customer service, but also economic losses which is incurred due to errors in the fleets of the preparation of documents and violations of customs clearance and border crossings. Thus there is the question of how to organize cargo transportation with the involvement of local transport companies. Currently, freight transportation is a specialization for a sufficient number of companies and firms. The best center of road transportation must have these qualities:

- To guarantee the security of cargo during the transportation;
- To have imputed prices for freight traffic;
- To carry cargo in a timely manner;
- To have a proper service for cargo transportation;
- To carry out transportation of various ranges;
- To provide transportation of large, heavy and general cargo ;
- To have a car park, which is up to-date;
- To have experienced drivers in a staff.

The next form of organization of quality management of cargo transportation in regions of Kazakhstan - centralized (Figure 4).



**Figure 4: Schematic Diagram of the Organizations of Centralized form of Goods Delivery on the Example of Atyrau Region**

Centralized transportation is not common, as they require a well-established supply of large volumes of cargo. They are mainly used in the construction industry for the transport of concrete, brick, mortar, concrete products, etc.

This form of quality management implementation is characterized by the full freight of forwarding service. Transportation of the total volume of goods by the supplier for permanent clientele, detailed allocation of responsibilities between the clients and the freight carrier are characteristics of this type of management, financial calculations are made by the party entered into an agreement.

Due to the fact that a centralized form of organization of quality management involves all cargo capacity of local companies to undeniable benefits. It includes increasing efficiency of delivery of cargo; carriers monitor the traffic increase productivity, and develop the best options, the conditions for the consolidation of the supply and use of goods trains, mechanization the whole complex handling. The disadvantages of centralized form of freight management should include reducing the reliability of delivery of goods to consumers, the benefits do not meet the condition of carriage of goods and also change the order of delivery of cargo sales organizations. So you must estimate and calculate what to choose: to carry more quickly or light trucks by the shortest route - cars Gazelle class, Iveco, Daily, Mercedes Sprinter and others ( 7-22 m., and 1.5-2.5 etc. ), or to download a couple of vehicles KAMAZ class, Iveco Euro Cargo, Mercedes Atego ( 35-60 m. and 4-10 tons), or even hire a Euro- wagon ( 82-86 m., and 20 t.) and move them all at once.

The advantage of road transportation is the ability to deliver cargo "door to door". Therefore, when choosing a mode of transport for distant transportation of oversized and heavy cargo the central place takes the cost. World practice proved that the transport costs of transportation of oversized and heavy cargo justified even at 30 % of its value.

In organizing the transportation can be developed several routes of delivery of cargo:

- The route of cargo (need to cross any geographic or national boundaries)
- The nature of the cargo,
- The desired delivery rate.

Another type of transportation is decentralized road transportation, which is different by consignees leading role: they order transport from cargo carriers by their own, organize loading and unloading, without the consent order with the shipper, management of freight, so at the expense of the recipient. For the carriage by company the consignees have a staff of experts: movers, forwarders, supply agents. The advantages of this form of organization of transportation are the timely and reliable delivery of cargo as well as traffic management is dependent on the needs of the implementor. Disadvantages are reducing of the efficiency of freight in connection with an independent buyer of the cargo, without the expertise of transportation organizations, i.e. increases the number of involved people (stevedores, freight forwarders), in this regard, there is an increase of the cost of shipping goods.

## **CONCLUSIONS**

Transferring to work on a system "exactly on time" will require more deep analysis of the rolling stock on the route, the adjustment of the existing accounting standards and the existing excessive downtime, which will improve the accuracy and reality of targets, and eventually it will lead to an increase in reliability of logistics goals. In a market system an important requirement of the consumer of transport service is timely and qualitative delivery of cargo. Insufficient development of advanced logistics freight transport technology systems leads to an increase in transport costs, therefore, the loss of the market.

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